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# PATENT ABSTRACTS OF JAPAN

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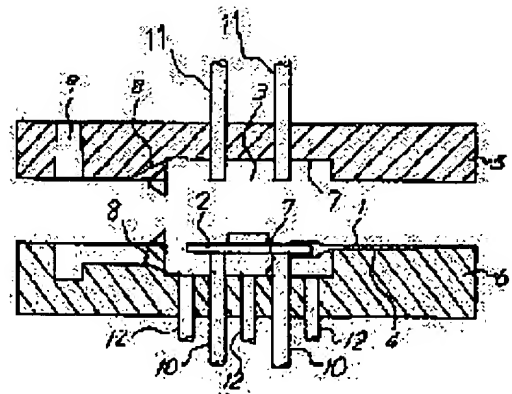
KINOSHITA HIDEKI

## (54) RESIN SEAL MOLDING METHOD FOR ELECTRIC AND ELECTRONIC PARTS AND TOOL USED THEREFOR

(57)Abstract:

**PROBLEM TO BE SOLVED:** To prevent unfilling and uneven filling from being generated by a method wherein molten resin is filled in a molding space, a holding member is retreated from the molding space, and further the molten resin is filled therein.

**SOLUTION:** Holding members 10, 11 are projected into a molding tool part from molding tools 5, 6, and an ejector pin 12 is retreated to a lower surface 7 of a bottom molding tool 6. Under this state, a part to be sealed by resin is positioned at a specific position of the bottom molding tool 6. Then, a top molding tool 5 is closed, and the part is held in a molding tool part 3 being a molding space enclosed by the top and bottom tools 5, 6. In a next process, after injecting the molten resin from above and below the part through a transfer passage 9 and a side gate 8, the resin is supplementarily filled in the molding space 3, and the part is fixed not to be moved. Thereafter, the holding members 10, 11 are retreated to the lower surface 7 of the molding tools 5, 6, and further the molten resin is successively injected into the molding space by specific pressure.



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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the method of carrying out the resin seal of the electrical and electric equipment and the electronic parts, such as IC, diode, and a capacitor, with injection molding. It is related with the metal mold which uses in detail the electrical and electric equipment and electronic parts which have a lead terminal at one marginal part for the uniform method and uniform it which it is thick and carry out a resin seal.

[0002]

[Description of the Prior Art] Conventionally, as closure technology for protecting the electrical and electric equipment and electronic parts, such as IC, diode, and a capacitor, from a mechanical and electric external environment, it is cheap and the resin seal excellent in mass-production nature is performed. As the method of a resin seal, there are a casting method by thermosetting resin, dip coating, the transfer-molding method, a fluidized bed coating process by the fine-particles resin, etc., and there is an injection-molding method by thermoplastics etc. further.

[0003] Although the resin seal of many of electrical and electric equipment and electronic parts which have a lead terminal only in one marginal part conventionally on the other hand was carried out by the fluidized bed coating process, the casting method, etc., it needed the complicated process of putting these parts into the case which has the fault that the configuration or thickness of a portion by which the resin seal was carried out are not fixed, and was beforehand fabricated in the casting method with injection molding etc., and carrying out casting, in the fluidized bed coating process.

[0004] Therefore, while direct injection molding performs this resin seal and regularity-izing the configuration, to abolish a case and to measure the simplification of a process is desired. However, usually, since it is a narrow thing very much, a lead terminal is difficult to have the fault with the diameter of 0.5mm, a thickness [ of 0.5mm ], and a width of about 0.5-1.5mm that rigidity tends to bend few, and to hold in the regular position of forming space therefore. Moreover, thickness of the resin layer which it was easy to produce movement and deformation of the electrical and electric equipment and electronic parts, consequently was closed by the vigor with which the melting resin with which it fills up flows cannot become fixed easily. Furthermore, an injury may be caused when excessive.

[0005] on the other hand, this invention persons -- fabrication -- metal mold -- while holding the parts which should be closed to predetermined forming space by the attachment component which can appear frequently freely inside -- fabrication -- \*\*\*\*\* -- by being filled up with a melting resin, making an attachment component retreat from forming space subsequently, and being further filled up with a melting resin, it is thick and the uniform thing which can be done for a resin seal is found out (Refer to JP,5-21492,A)

[0006] However, the parts which should be closed moved in the vertical direction near the gate at the time of restoration, and by the pressure differential of a flow end, and there was a case where it was thick and the uniform thing to do for a resin seal was difficult. Moreover, it closed, when either on power parts or the bottom was narrow-width space, being un-filled up arose, or uneven restoration

occurred, and deformation of closure parts and when excessive, the injury on a crack etc. might be caused.

[0007]

[Problem(s) to be Solved by the Invention] The purpose of this invention is to offer the metal mold used for the uniform forming method which is thick and carries out the resin seal of the electrical and electric equipment and the electronic parts, and it, without [ without being un-filled up arises or uneven restoration occurs, and ] causing deformation of closure parts and the injury on a crack etc.

[0008]

[Means for Solving the Problem] That is, it fills up this forming space with a melting resin, holding these parts to forming space by the attachment component which projects from the upper part of forming space, and the attachment component which projects from a lower part, in case the summary of this invention carries out the resin seal of the electrical and electric equipment and the electronic parts with injection molding, subsequently makes this attachment component retreat from forming space, and consists in the resin-seal fabrication method of of the electrical and electric equipment and electronic parts characterized by being further filled up with a melting resin.

[0009] Hereafter, this invention is explained in detail. Although there is especially no limit as the electrical and electric equipment and electronic parts which can carry out a resin seal in this invention, and IC, diode, a capacitor, a hybrid IC substrate, a transistor, Light Emitting Diode, bimetal, a solenoid coil, etc. are applied to all and got, it is effective to the electrical and electric equipment and electronic parts which have especially lead wire. An effect is large to what has a lead terminal only at one marginal part also especially in it. Compared with what has a lead terminal at both marginal parts, it is because it was easy to be influenced of deformation by the flow of a resin etc. by the former.

[0010] As the electrical and electric equipment and electronic parts with which this invention is applied, preferably, it is the hybrid IC substrate which has a lead terminal at one marginal part, and, specifically, what was indicated to drawing 1 and drawing 2 is mentioned. ((One shows a lead terminal among drawing 1 and 2.) 2 shows a substrate.)

Moreover, although there is especially no limit and various kinds of thermoplastics is usable if the resin used in this invention is usually used for injection molding, preferably, it has a melting anisotropy and the liquid crystal polyester resin which shows a good fluidity, polybutyrene terephthalate resin, the poly arylene sulfide resin, etc. are mentioned. As for these, you may fill up with a glass fiber.

[0011] the resin-seal method of this invention -- fabrication -- metal mold -- the attachment component which projects from the upper part of the forming space which appears frequently inside, and the attachment component which projects from a lower part are used In case it equips with the electrical and electric equipment and electronic parts (only henceforth parts), the attachment component which projects parts from the wearing backward upper part on it considering the attachment component which projects from a lower part as a state of appearance is changed into the state of appearance, and is held. this time -- a lead terminal -- fabrication -- it was prepared in the mating face of metal mold -- it receives and inserts in a slot Thereby, parts can be held with an easily and sufficient precision to predetermined forming space.

[0012] Subsequently, resin-seal mold goods are obtained by retreating an attachment component, after fixing so that the forming space of the closed metal mold may be filled up with a melting resin and parts may not move to it, and making it further filled up with a melting resin. In order to retreat an attachment component, timing can be shifted and the attachment component which the attachment component which projects from the upper part, and the attachment component which projects from a lower part may be retreated almost simultaneous, and projects from the upper part, and the attachment component which projects from a lower part can also be retreated.

[0013] Furthermore, it is desirable to use for forming space the metal mold whose pouring gate for carrying out pouring restoration of the melting resin is the pouring gate which consists of the gate for pouring in caudad with the gate for pouring in above parts as metal mold used for the resin-seal fabrication method of this invention, by being filled up so that a melting resin may cover parts, movement and deformation of parts can be prevented and the injury on parts can be prevented.

Moreover, it is also desirable to change size for the size of the pouring gate of the upper part and a lower part in proportion to the volume ratio of the narrow-width space of forming space and double width space, to make small size of the gate by the side of narrow-width space, and to enlarge size of the gate by the side of double width space when preventing movement and deformation of pouring restoration of a melting resin of the parts in the case.

[0014] Since according to this invention the attachment component supports parts from the lower part from the upper part in case parts are held to forming space, it can position in the regular position of forming space. this state -- setting -- forming space -- a melting resin -- injecting -- the movement of parts -- stopping -- subsequently -- an attachment component -- metal mold -- by making it retreat to a field and injecting a melting resin continuously after that, a resin seal is made by uniform thickness and the mold goods of a fixed configuration are obtained According to this invention, since movement of parts does not take place, the receptacle slot for move prevention conventionally established in the attachment component can be excluded, and the hollow generation defect produced in the outside surface of mold goods can be abolished.

[0015]

[Example] Although an example and drawing explain this invention still in detail below, this invention is not restricted to the following examples and drawings, unless the summary is exceeded. Drawing 3 - drawing 7 are cross-section explanatory drawings of an important section showing the process of the resin-seal method of this example. The insert molding by injection molding is applied in this example.

[0016] While the attachment component (the inside of drawing 3 , 10 and 11) by which the metal mold used for the resin-seal method of this invention can appear frequently freely in forming space is prepared, the knock-out pin 12 which takes out the mold goods after a resin seal from the form-block section 3 (portion used as forming space) is formed. The receptacle slot 4 for equipping with lead wire 1 is established in the mating face (parting line) of metal mold.

[0017] Moreover, the so-called side gate 8 which is well-informed about the transfer path 9 for carrying out pouring restoration of the melting resin and the side of the form-block section 3 is formed in this molding section. the standby state which opened metal mold (inside 5 and 6 of drawing 3 ) at first in the resin-seal method of this invention -- setting -- fabrication -- the form-block circles from metal mold 5 and 6 -- attachment components 10 and 11 -- projecting -- \*\*\*\* -- a knock-out pin 12 -- lower fabrication -- it is retreating to the low side 7 of metal mold 6

[0018] the parts which should be carried out a resin seal in this state -- lower fabrication -- it positions in the regular position of metal mold 6 ( drawing 3 ) That is, it equips with parts on the attachment component in a protrusion state. this time -- lead wire 1 -- fabrication -- it was prepared in the mating face of metal mold -- it receives and inserts in a slot 4 Thereby, these parts are held in predetermined forming space ( drawing 3 ).

[0019] subsequently, up fabrication -- metal mold 5 -- closing -- these parts -- the upper and lower sides -- it holds in the form-block section 3 which is the forming space surrounded with metal mold 5 and 6 ( drawing 4 ) In the following process, after letting the transfer path 9 and a side gate 8 pass and pouring in the melting resin 13 from the upper part of parts, and a lower part, it fixes so that complementary restoration may be carried out and these parts may not move to the forming space 3 ( drawing 5 ). In addition, the state where complementary restoration was filled up with the resin to about 90 - 95 % of the weight to the last restoration state is said.

[0020] then, the attachment components 10 and 11 -- fabrication -- it is made to retreat to the low side 7 of metal mold 5 and 6, and the melting resin 13 is further injected by the predetermined pressure to forming space continuously thereby -- the melting resin 13 -- parts and fabrication -- the crevice between the back faces of metal mold 5 and 6 and attachment components 10 and 11 is filled up completely, and the predetermined resin film 14 is formed in it ( drawing 6 ) the up fabrication after forming the resin film 14 of parts into a cooling individual in the following process -- metal mold -- by opening five, pushing up a knock-out pin 12, and taking out mold goods, as shown in drawing 7 , resin-seal mold goods are obtained

[0021] In addition, in this example, it was considered that injection molding was carried out by the low

speed and the low voltage force, and movement and the injury on parts by the vigor of a melting resin became the minimum from usual using nova curate E322G30 (the product made from Mitsubishi Engineering Plastics and a nova curate are a registered trademark) which are the liquid crystal polymer of the polyester system which shows good melting flowability. Moreover, although the attachment component was moved in this example with the drive method which used the pneumatics cylinder, of course, the mechanical drive of an oil hydraulic cylinder and gum, a gear, etc. is also possible.

[0022]

[Effect of the Invention] According to this invention, the resin seal of the electrical and electric equipment and the electronic parts can be carried out with uniform thickness, without [ since the regular position of forming space can be equipped with the electrical and electric equipment and electronic parts easily and correctly, without being un-filled up arises or uneven restoration occurs, and ] causing deformation of closure parts and the injury on a crack etc. Moreover, since it is filled up so that a melting resin may cover parts by installing respectively the pouring gate for carrying out pouring restoration of the melting resin in the upper part of parts, and a lower part, the injury on parts can be prevented. Therefore, moreover, the electrical and electric equipment and electronic parts can close at one process of only injection molding, and the configuration and thickness of mold goods can be made regularity, and injection-molding-ization of the electrical and electric equipment and electronic parts with especially lead wire can be realized, and it has further the advantage that the resin layer of uniform thickness can really be fabricated to a bill-of-materials side.

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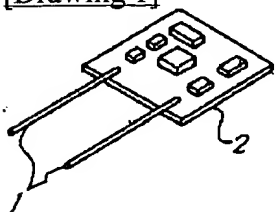
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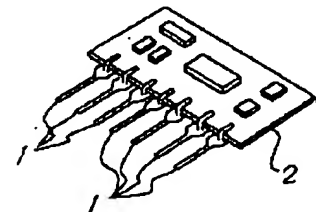
DRAWINGS

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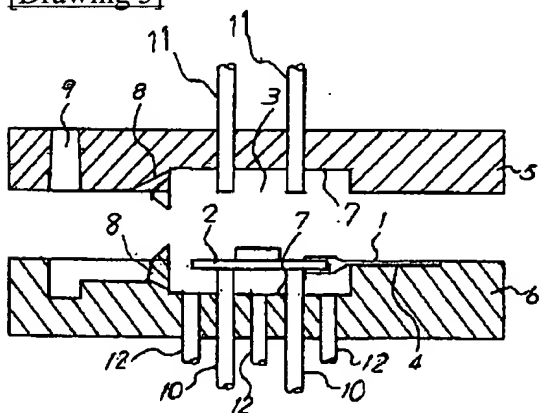
[Drawing 1]



[Drawing 2]

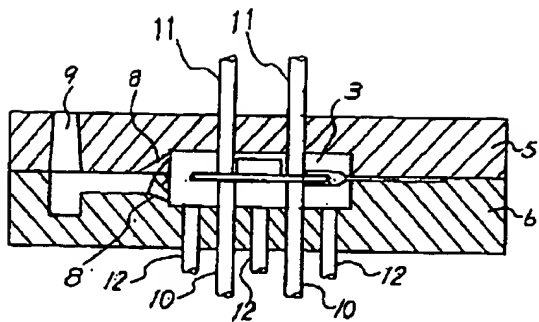


[Drawing 3]

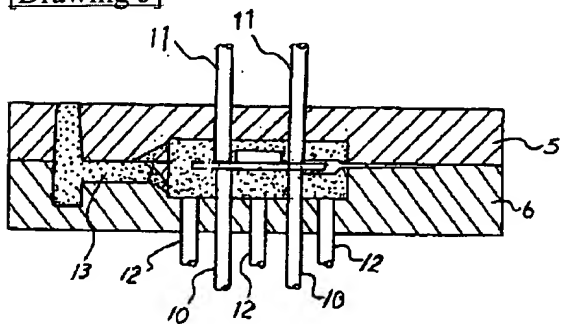


[Drawing 4]

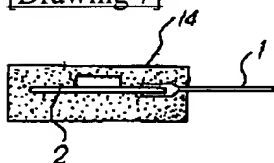




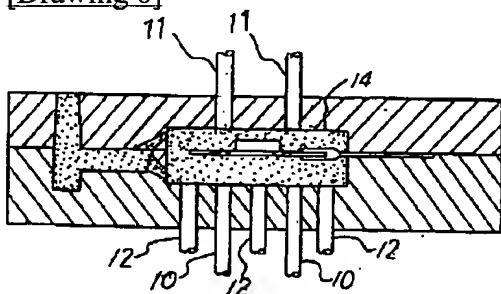
[Drawing 5]



[Drawing 7]



[Drawing 6]




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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the appearance perspective diagram of the electrical and electric equipment and electronic parts which has lead wire.

[Drawing 2] It is the appearance perspective diagram of the electrical and electric equipment and electronic parts which has lead wire.

[Drawing 3] It is important section cross-section explanatory drawing showing process drawing of the resin-seal method in the example of this invention.

[Drawing 4] It is important section cross-section explanatory drawing showing process drawing of the resin-seal method in the example of this invention.

[Drawing 5] It is important section cross-section explanatory drawing showing process drawing of the resin-seal method in the example of this invention.

[Drawing 6] It is important section cross-section explanatory drawing showing process drawing of the resin-seal method in the example of this invention.

[Drawing 7] It is important section cross-section explanatory drawing showing process drawing of the resin-seal method in the example of this invention.

[Description of Notations]

- 1 Lead Wire
- 2 Hybrid IC Substrate
- 3 Form-Block Section
- 4 Receptacle Slot for Equipping with Lead Wire
- 5 Up Fabrication -- Metal Mold
- 6 Lower Fabrication -- Metal Mold
- 7 Lower Fabrication -- Low Side of Metal Mold
- 8 Side Gate
- 9 Transfer Path of Resin
- 10 Attachment Component Which Projects from Lower Part
- 11 Attachment Component Which Projects from Upper Part
- 12 Knock-out Pin
- 13 Melting Resin
- 14 Resin Film

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CLAIMS

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[Claim(s)]

[Claim 1] The resin-seal fabrication method of of the electrical and electric equipment and electronic parts characterized by filling up this forming space with a melting resin, holding these parts to forming space by the attachment component which projects from the upper part of forming space, and the attachment component which projects from a lower part in case the resin seal of the electrical and electric equipment and the electronic parts is carried out with injection molding, making this attachment component retreat from forming space subsequently, and being further filled up with a melting resin.

[Claim 2] metal mold -- the forming space from a wall surface -- projection -- the bottom -- an attachment component -- having -- and this attachment component -- the need -- responding -- metal mold -- the metal mold used for the resin-seal fabrication method according to claim 1 characterized by having the mechanism which retreats in a wall surface

[Claim 3] Metal mold which uses a bird clapper for the resin-seal fabrication method according to claim 1 by which it is characterized from the gate for the pouring gate for carrying out pouring restoration pouring a melting resin into the gate and the lower part for pouring in above these parts in forming space.

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CLIPPEDIMAGE= JP409076282A  
PAT-NO: JP409076282A  
DOCUMENT-IDENTIFIER: JP 09076282 A  
TITLE: RESIN SEAL MOLDING METHOD FOR ELECTRIC AND ELECTRONIC  
PARTS AND TOOL  
USED THEREFOR

PUBN-DATE: March 25, 1997

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COUNTRY

N/A

APPL-NO: JP07241548

APPL-DATE: September 20, 1995

INT-CL (IPC): B29C045/14; B29C033/12 ; B29C045/26 ; B29C045/56 ;  
H01L021/56

ABSTRACT:

PROBLEM TO BE SOLVED: To prevent unfilling and uneven filling from being generated by a method wherein molten resin is filled in a molding space, a holding member is retreated from the molding space, and further the molten resin is filled therein.

SOLUTION: Holding members 10, 11 are projected into a molding tool part from molding tools 5, 6, and an ejector pin 12 is retreated to a lower surface 7 of a bottom molding tool 6. Under this state, a part to be sealed by resin is positioned at a specific position of the bottom molding tool 6. Then, a top molding tool 5 is closed, and the part is held in a molding tool part 3 being a molding space enclosed by the top and bottom tools 5, 6. In a next process, after injecting the molten resin from above and below the part through a transfer passage 9 and a side gate 8, the resin is supplementarily filled in

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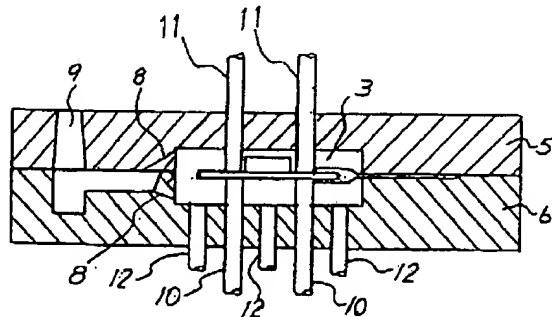
(74) 代理人 弁理士 長谷川 暁司

(54) 【発明の名称】 電気・電子部品の樹脂封止成形方法及びそれに用いる金型

(57) 【要約】

【課題】 未充填が生じたり、不均一充填が発生することなく、また、封止部品の变形や、割れ等の損傷を起こすことなく、均一な肉厚で、電気・電子部品を樹脂封止する成形方法及びそれに用いる金型を提供する。

【解決手段】 電気・電子部品を射出成形により樹脂封止する際に、該部品を成形空間の上方から突出する保持部材と下方から突出する保持部材とにより成形空間に保持しつつ該成形空間に溶融樹脂を充填し、次いで該保持部材を成形空間より後退せしめ、更に溶融樹脂を充填する、電気・電子部品の樹脂封止成形方法。



## 【特許請求の範囲】

【請求項1】 電気・電子部品を射出成形により樹脂封止する際に、該部品を成形空間の上方から突出する保持部材と下方から突出する保持部材とにより成形空間に保持しつつ該成形空間に熔融樹脂を充填し、次いで該保持部材を成形空間より後退せしめ、更に熔融樹脂を充填することを特徴とする電気・電子部品の樹脂封止成形方法。

【請求項2】 金型壁面から成形空間に突出した保持部材を有し、かつ該保持部材が、必要に応じ金型壁面内に後退する機構を有することを特徴とする請求項1に記載の樹脂封止成形方法に用いる金型。

【請求項3】 成形空間に熔融樹脂を注入充填するための注入ゲートが、該部品の上方に注入するためのゲートと下方に注入するためのゲートとからなることを特徴とする請求項1に記載の樹脂封止成形方法に用いる金型。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、射出成形により、IC、ダイオード、コンデンサー等の電気・電子部品を樹脂封止する方法に関する。詳しくは、一方の縁部にリード端子を有する電気・電子部品を均一な肉厚で樹脂封止する方法及びそれに用いる金型に関するものである。

## 【0002】

【従来の技術】従来より、IC、ダイオード、コンデンサー等の電気・電子部品を機械的・電氣的な外部環境から保護するための封止技術として、安価で量産性に優れた樹脂封止が行なわれている。樹脂封止の方法としては、熱硬化性樹脂による注型法、浸漬法、トランスファー成形法、粉体樹脂による流動浸漬法等があり、更に熱可塑性樹脂による射出成形法等がある。

【0003】一方、従来、一方の縁部にのみリード端子を持つ電気・電子部品の多くは、流動浸漬法、注型法などで樹脂封止されているが、流動浸漬法では樹脂封止された部分の形状や厚みが一定でないという欠点を有しており、また、注型法では、あらかじめ射出成形等により成形したケースに該部品を入れ注型するという複雑な工程を必要とした。

【0004】そのため、かかる樹脂封止を直接射出成形で行なって、その形状を一定化するとともに、ケースを無くして工程の簡素化を計ることが望まれている。しかし、通常、リード端子は、直径0.5mm、厚み0.5mm、巾0.5～1.5mm程度の極めて細いものであるから、剛性が少なかったりという欠点を有し、よって、成形空間の定位置に保持することが困難である。また、充填される熔融樹脂の流れの勢いにより、電気・電子部品の移動や変形が生じやすく、その結果、封止された樹脂層の厚みが一定となりにくい。更に、甚だしい場合は損傷を起こすことがある。

【0005】これに対し、本発明者らは、成形金型内

に、自由に出没しうる保持部材により、封止すべき部品を所定の成形空間に保持しつつ、成形空間に熔融樹脂を充填し、ついで保持部材を成形空間より後退せしめて、更に熔融樹脂を充填することにより、均一な肉厚で樹脂封止しうることを見出している。(特開平5-21492号参照)

【0006】しかしながら、充填時のゲート付近と流動末端の圧力差により、封止すべき部品が上下方向に移動し、均一な肉厚で樹脂封止することが困難な場合があった。また、封止すべき部品の上又は下のいずれかが狭幅空間である場合には、未充填が生じたり、不均一充填が発生し、封止部品の変形や甚だしい場合には、割れ等の損傷を起こすことがあった。

## 【0007】

【発明が解決しようとする課題】本発明の目的は、未充填が生じたり、不均一充填が発生することなく、また、封止部品の変形や、割れ等の損傷を起こすことなく、均一な肉厚で、電気・電子部品を樹脂封止する成形方法及びそれに用いる金型を提供することにある。

## 【0008】

【課題を解決するための手段】すなわち、本発明の要旨は、電気・電子部品を射出成形により樹脂封止する際に、該部品を成形空間の上方から突出する保持部材と下方から突出する保持部材とにより成形空間に保持しつつ該成形空間に熔融樹脂を充填し、次いで該保持部材を成形空間より後退せしめ、更に熔融樹脂を充填することを特徴とする、電気・電子部品の樹脂封止成形方法に存する。

【0009】以下、本発明を詳細に説明する。本発明において樹脂封止しうる電気・電子部品としては特に制限はなく、IC、ダイオード、コンデンサー、ハイブリッドIC基板、トランジスタ、LED、バイメタル、ソレノイドコイル等いずれにも適用されうるが、特にリード線を有する電気・電子部品に対して効果がある。その中でも特に、リード端子を一方の縁部にのみ有するものに対して効果が大きい。両方の縁部にリード端子を有するものに比べ、従来より樹脂の流れによる変形等の影響を受け易かったからである。

【0010】本発明が適用される電気・電子部品としては、好ましくは、一方の縁部にリード端子を有するハイブリッドIC基板等であり、具体的には、図1及び図2に記載したようなものが挙げられる。(図1、2中、1はリード端子を、2は基板を示す。)

また、本発明において用いられる樹脂は、通常射出成形に用いられるものであれば特に制限はなく、各種の熱可塑性樹脂が使用可能であるが、好ましくは、溶融異性を有し、良好な流動性を示す液晶ポリエステル樹脂、ポリブチレンテレフタレート樹脂、ポリアリーレンスルフィド樹脂等が挙げられる。これらはガラス繊維が充填されたものであってもよい。

【0011】本発明の樹脂封止方法では、成形金型内に出没する、成形空間の上方から突出する保持部材と下方から突出する保持部材とを用いる。電気・電子部品（以下、単に部品という。）を装着する際には、下方から突出する保持部材を出の状態として、その上に部品を装着後上方から突出する保持部材を出の状態にして保持する。このときリード端子は成形金型の合わせ面に設けられた受け溝に挿入する。これにより、部品を所定の成形空間へ、容易にかつ精度良く保持することができる。

【0012】次いで、閉じた金型の成形空間に熔融樹脂を充填して部品が動かないよう固定した後に保持部材を後退させ、更に、熔融樹脂を充填させることによって、樹脂封止成形品を得る。保持部材を後退させるには、上方から突出する保持部材と下方から突出する保持部材とを、ほとんど同時に後退させてもよく、また、上方から突出する保持部材と下方から突出する保持部材とをタイミングをずらして後退させることもできる。

【0013】更に、本発明の樹脂封止成形方法に用いる金型として、成形空間に熔融樹脂を注入充填するための注入ゲートが、部品の上方に注入するためのゲートと下方に注入するためのゲートとからなる注入ゲートである金型を用いることが好ましく、熔融樹脂が部品を覆うように充填することにより、部品の移動や変形を防ぐことができ、部品の損傷を防ぐことができる。また、上方と下方の注入ゲートのサイズを成形空間の狭幅空間と広幅空間の容積比に比例してサイズを変え、狭幅空間側のゲートのサイズを小さくし、広幅空間側のゲートのサイズを大きくすることも、熔融樹脂の注入充填の際の部品の移動や変形を防ぐ上で好ましい。

【0014】本発明によれば、部品を成形空間に保持する際、保持部材が部品を上方からと下方からとで支えているので成形空間の定位置に位置決めすることができる。この状態において、成形空間に熔融樹脂を射出して部品の動きを止め、次いで保持部材を金型面まで後退させ、その後連続して熔融樹脂を射出することにより、均一の厚みで樹脂封止が出来、一定形状の成形品が得られる。本発明によれば、部品の移動が起こらないため、保持部材に従来設けられていた移動防止用受け溝を省くことができ、成形品の外表面に生じる窪み生成欠陥を無くすることができる。

【0015】

【実施例】以下に、本発明を、実施例及び図により更に詳細に説明するが、本発明はその要旨を越えない限り、以下の実施例及び図に制限されるものではない。図3～図7は、本実施例の樹脂封止方法の工程を示す要部の断面説明図である。本実施例では、射出成形によるインサート成形が適用される。

【0016】本発明の樹脂封止方法に用いる金型は、成形空間内に自由に出没可能な保持部材（図3中、10及び11）が設けられていると共に、樹脂封止後の成形品

を成形型部3（成形空間となる部分）から取出す突出しピン12が設けられている。金型の合わせ面（パーティンライン）には、リード線1を装着する為の受け溝4が設けられている。

【0017】また、該成型部に熔融樹脂を注入充填するための移送通路9、及び成型型部3の側面に通ずるいわゆるサイドゲート8が形成されている。本発明の樹脂封止方法においては、最初は、金型（図3中5、6）を開けた待機状態において、成形金型5、6から成型型部内に保持部材10と11が突出しており、突出しピン12は下部成型金型6の底面7まで後退している。

【0018】この状態のとき、樹脂封止すべき部品を下部成型金型6の定位置に位置決めする（図3）。即ち、突出状態にある保持部材の上に部品を装着する。このとき、リード線1を、成形金型の合わせ面に設けられた受け溝4に挿入する。これにより、該部品が所定の成形空間に保持される（図3）。

【0019】次いで、上部成型金型5を閉成し、該部品を上下金型5、6で囲まれた成形空間である、成型型部3に保持する（図4）。次の工程においては、移送通路9及びサイドゲート8を通して、熔融樹脂13を部品の上方及び下方より注入した後、成形空間3に余充填し、該部品が移動しないよう固定する（図5）。尚、余充填とは、最終の充填状態に対し、約90～95重量%まで樹脂を充填した状態をいう。

【0020】その後、保持部材10、11を成型金型5、6の底面7まで後退させ、更に連続して成形空間に対し熔融樹脂13を所定圧力で射出する。これにより、熔融樹脂13は部品と成型金型5、6および保持部材10、11の支持面との隙間に完全に充填され、所定の樹脂膜14が形成される（図6）。次の工程において、部品の樹脂膜14を冷却固化した後、上部成型金型5を開け、突出しピン12を押し上げて、成形品を取出すことにより、図7に示す如く樹脂封止成形品が得られる。

【0021】尚、本実施例では、良好な熔融流動特性を示すポリエステル系の液晶ポリマーであるノバキュレートE322G30（三菱エンジニアリングプラスチックス（株）製、ノバキュレートは登録商標）を用い、通常より低速度且つ低圧力で射出成形し、熔融樹脂の勢いによる部品の移動や損傷が最小限になるよう考慮した。また、本実施例では、空圧シリンダーを用いた駆動方式により保持部材を動かしたが、油圧シリンダー及びゴム、ギヤー等の機械的駆動も勿論可能である。

【0022】

【発明の効果】本発明によれば、電気・電子部品を、成形空間の定位置に、容易にかつ正確に装着することができるので、未充填が生じたり、不均一充填が発生することなく、また、封止部品の変形や、割れ等の損傷を起こすことなく、均一な肉厚で、電気、電子部品を樹脂封止することができる。また、熔融樹脂を注入充填するため

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の注入ゲートを部品の上方と下方とに各々設置することにより、溶融樹脂が部品を覆うように充填するため、部品の損傷を防止することができる。従って、電気・電子部品が射出成形のみの一工程で封止でき、しかも、成形品の形状及び厚みを一定にすることができ、特にリード線を持つ電気・電子部品の射出成形化が実現でき、さらに、部品表面に均一厚みの樹脂層を一体成形し得るという利点を有する。

【図面の簡単な説明】

【図1】リード線を有する電気・電子部品の外観斜視図である。

【図2】リード線を有する電気・電子部品の外観斜視図である。

【図3】本発明の実施例における樹脂封止方法の工程図を示す要部断面説明図である。

【図4】本発明の実施例における樹脂封止方法の工程図を示す要部断面説明図である。

【図5】本発明の実施例における樹脂封止方法の工程図を示す要部断面説明図である。

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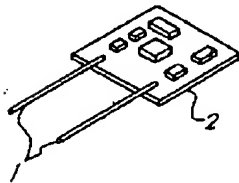
【図6】本発明の実施例における樹脂封止方法の工程図を示す要部断面説明図である。

【図7】本発明の実施例における樹脂封止方法の工程図を示す要部断面説明図である。

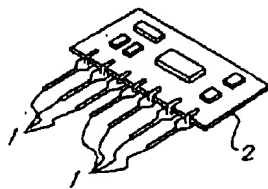
【符号の説明】

- 1 リード線
- 2 ハイブリッドIC基板
- 3 成形型部
- 4 リード線を装着する為の受け溝
- 5 上部成形金型
- 6 下部成形金型
- 7 下部成形金型の低面
- 8 サイドゲート
- 9 樹脂の移送通路
- 10 下方から突出する保持部材
- 11 上方から突出する保持部材
- 12 突出しピン
- 13 溶融樹脂
- 14 樹脂膜

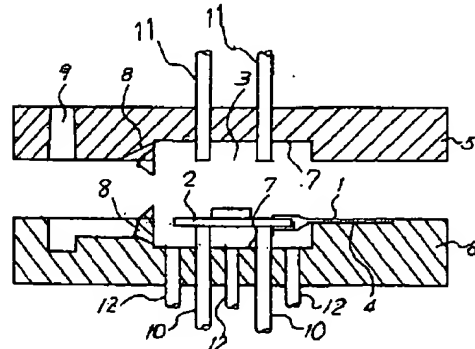
【図1】



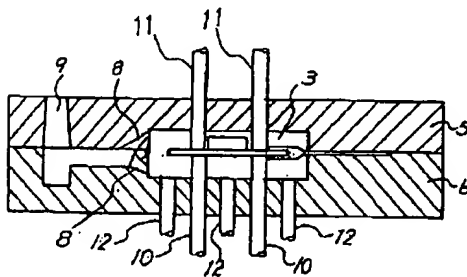
【図2】



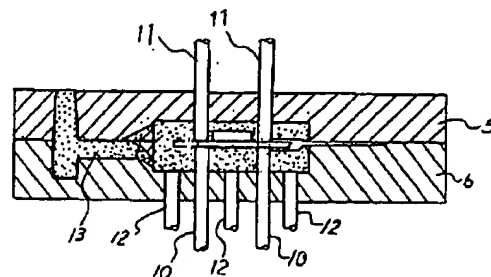
【図3】



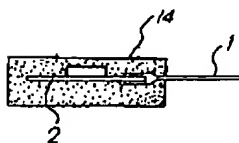
【図4】



【図5】



【図7】





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【図6】

